Developing Real-World Math through Literacy

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The article depicts two mathematical lessons in a first grade classroom that incorporate literacy throughout to increase students' knowledge and understanding of the mathematical concepts. The first lesson uses the book, The Doorbell Rang *(1987) to introduce sharing and dividing, and the second lesson incorporate the book,* The Penny Pot *(1998) to reinforce counting money. In both lessons, the students explore mathematics through read-alouds, problem solving, classroom discussions, and manipulative use. The article presents the two different lessons in detail and includes classroom discussions to illustrate the students' thinking process, understanding, and discovery of the two different mathematical concepts being taught in the classroom.*

Introduction

Helping young children develop a strong understanding of mathematical concepts is one of the most important goals for primary grade teachers. Teachers can make mathematics come alive for young learners by incorporating literacy, reading, and writing into the mathematics classroom. Literacy has been shown to help enhance student learning and confidence in mathematics, especially with students who struggle to understand mathematical concepts (Whitin & Whitin, 2000).

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The National Council of Teachers in Mathematics' (2000) Process Standard of Communication states that reading, writing, and speaking are essential components of the everyday mathematics classroom. Using literacy activities incorporates the communication processing standard and challenges students to deepen their level of mathematical knowledge by clarifying, justifying, and communicating their mathematical thinking.

As a first grade teacher, I utilize literacy in my mathematics lessons to motivate my students and to provide an opportunity for my students to develop their abilities to justify and clarify their thoughts in mathematics. My students are exposed to literacy within mathematics through activities, such as read-alouds, written explanations, and problem solving. With the integration of different literacy activities, students increase their oral and written communication skills in mathematics, begin to develop and strengthen their mathematical vocabulary, and see mathematics as a real world activity.

Cookie Sharing Activities with *The Doorbell Rang*

The following activities have been successful in my classroom when integrating literacy into mathematics. The book *The Doorbell Rang* (1987) by Pat Hutchins is one story used in my mathematics classroom to help students understand parts of a whole and/or simple division. In the story, the mother of Victoria and Sam bakes twelve cookies. The children are told that they need to share the cookies equally with each other, so each child receives six cookies. Then the doorbell rings and a friend walks into the kitchen. Victoria and Sam now have to share the twelve cookies between the three children, so each child receives four cookies. The story continues with more friends ringing the doorbell and entering the kitchen. The children must figure out how to share the cookies equally with each other. At the end of the story,

twelve children sit around the kitchen table with one cookie each, and the grandmother of Victoria and Sam enters with twelve more cookies for the children to share.

Launching the Lesson

I began the lesson by reading the story to the class without referencing the mathematics connection. To involve the students in the story, we recreated the story in the classroom and brought the story to life by having students take on the roles of the characters. As the students acted out the story, they worked together to share or divide the twelve cookies evenly. The entire class was able to participate by watching the students share cookies on an interactive whiteboard.

Equal Sharing

Once the students had an opportunity to watch or participate in recreating the story, the students worked in groups of four and were given 20 Unifix cubes and asked to equally share them among each other. As the students worked, I monitored the conversations and strategies of how each group shared the Unifix cubes. Here is one discussion from a group:

John: "Put all the cubes in the middle of the desks. Don't take any! Why don't we each take one until there are none left."

Sam: "Okay, we can do that!"

Katie: "Jacob, only take one not two!"

John: "Everybody needs to take one more." John said this once he visually saw four Unifix cubes and knew there were four people.

This group's strategy was to put all the cubes in the middle of the table and each child within the group took turns taking one piece at a time until the pieces were divided equally and each student had five cubes.

Revising the Task

I then posed the question "What would happen if someone else joins your group?" Each group was joined by a stuffed animal and was now asked to divide the 20 Unifix cubes equally among all five members. The four groups devised two different strategies to divide the cube among the five group members. One group put all the Unifix cubes back into the center of the table and used the same strategy as I described previously with four students.

John: "Give me all the cubes and put them back in the middle of the table."

Katie: "Why are we going to do that?"

John: "Everyone needs to have the same number, so if we put them back and then we do what we just did we will see how many we will each get."

Katie: "Okay"

The other three groups began to work together by giving the stuffed animals cubes from their piles. As these groups worked, they had to figure out strategies for evenly dividing the Unifix cubes. Some students wanted to share too many and other students were not sharing at all.

Simon: "We need to give him (stuff animal) some of ours." He put over two.

Courtney: "Here he can have some of mine." She gave away two of hers

Jake: "He didn't get any from me."

Robin: "Here is one of mine."

Teacher: "Look at how many all of you have and then how many the stuffed animal has. Do you have the cubes divided evenly? Does everyone have an equal amount?"

Simon: "He (stuffed animal) has five and I only have two. He (stuffed animal) has too many."

Teacher: "How could you work together, so everyone has the same amount?"

Simon: "We can each give him one and then we would all have four."

Teacher: "Do you all think this would work?"

Courtney, Jake, Robin: "Yes"

Some of the group members were more

As the students acted out the story, they worked together to share or divide the twelve cookies evenly.

concerned about being the ones to give their cubes to the stuffed animal that they did not think about everyone having an equal number of cubes until I prompted them with questions about the numbers of cubes each member of their group had now. Then the groups realized that each person could only give away one cube to make everyone have an even amount of Unifix cubes.

A Final Task

For the final portion of the lesson, the students worked independently and were asked to solve the problem, "Four students were given sixteen pieces of candy and asked to share the candy. Show how many pieces of candy each student will receive." The students were given half sheets of paper and asked to solve the problem using words, pictures, or numbers. This final activity allowed the students to clarify their thoughts about the parts and wholes and develop some beginning division skills. Once each student was given enough time to complete the task, they orally shared their reasons, solutions, and thought processes.

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Emma: "Each student will receive four pieces of candy."

Teacher: "How do you know four is correct?"

Emma: "I counted the pieces of candy and there are 16."

Teacher: "How did you figure out there were four pieces for each student?"

Emma: "I gave each person a piece of candy and kept counting until I got to 16."

Teacher: "Did you use a different way to get your answer?"

Jeff: "Yes, I used my crayons as the candy and gave each person two pieces at a time."

Teacher: "How many pieces did each of your people get?"

Jeff: "Each person got 4 pieces of candy."

Teacher: "Did you show that on your paper?"

Jeff: "Yes, I made circles for my candy."

The students relied heavily on the strategy of passing out one or two pieces of candy at a time to each person because this was the favored strategy used in the previous exercise with the Unifix cubes. The class began to see that a group of objects could be shared or divided by passing them out evenly until they had no more to pass out.

The classroom discussion allowed students to hear various strategies used to solve the problem and enhance their understanding, knowledge, communication and language skills while listening and speaking mathematically in the classroom. The students enhance their mathematical knowledge when they are required to write about mathematical concepts using their own words, diagrams, pictures, and graphs. Having students reflect on their learning helps the students to become self-aware of their own mathematical knowledge and mathematics language skills (Wason-Ellen, 1987). Requiring students to solve problems and show their work helps students to clarify and justify their ideas in their heads.

Counting Coins with *The Penny Pot*

Another useful classroom activity that I incorporate into my mathematics classroom is the book *The Penny Pot* (1998) by Stuart J. Murphy. I utilize the book to teach counting coins. In the story, Jessie, a little girl, wants to get her face painted for 50 cents, but when she counts her money she only has 39 cents, which is not enough money. A boy named Miguel comes along to get his face painted and he has 53 cents, so he gets his face painted and puts the extra three cents in the "penny pot" for someone else to use if they do not have enough money. Three more children come to get their faces painted and all the children have

more than 50 cents, so they all leave their extra money in the "penny pot." Jessie then counts all her money and the pennies from the penny pot to see if she now would have 50 cents. Jessie ends up having enough money and is able to get her face painted, too.

The interactive white board was used as a visual aide throughout the activity. A student would come up to the board and show the money that one character had and then the student would take any change greater than 50 cents and put it into the penny pot as suggested in Figure 1.

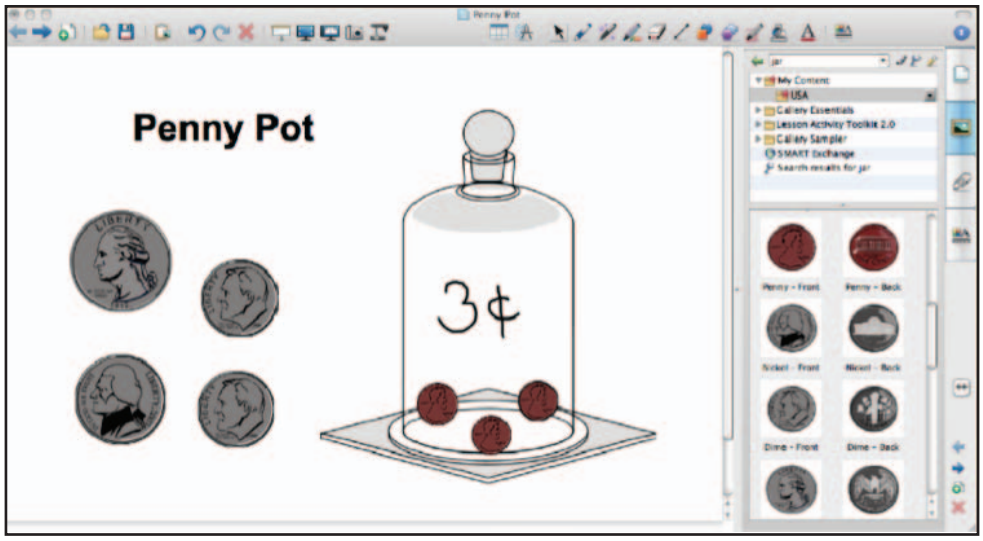

Fig 1 Modeling a scenario from *The Penny Pot* with interactive whiteboard software

As each character was introduced in the story, a new student would come to the board to help figure out how much money the child had and how much money would be left over. The entire class recounted the money out loud to make sure that their classmate had done the work correctly. When Jessie recounted her money with the "penny pot" money, the class did the same and saw that Jessie was able to now get her face painted as shown in Figure 2.

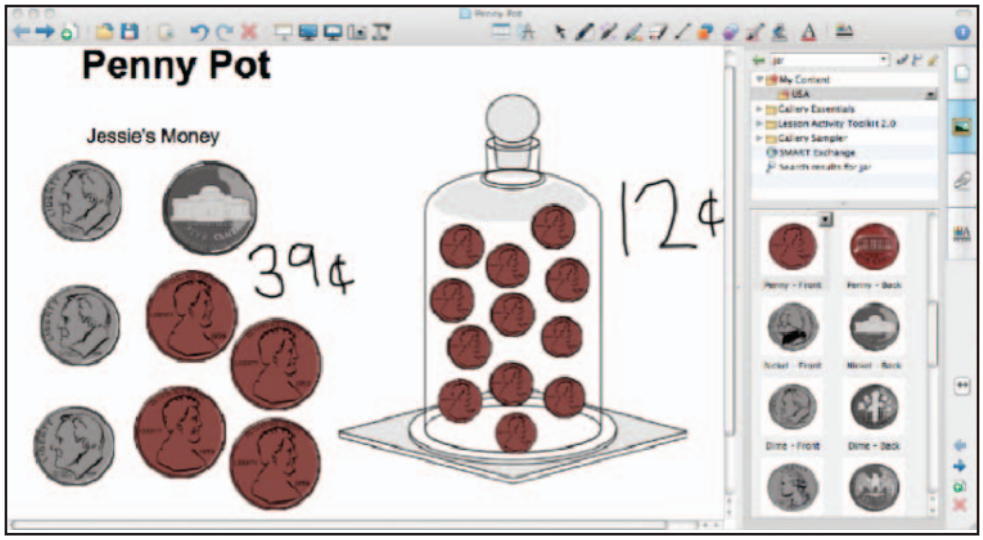

Fig 2 Modeling a scenario from *The Penny Pot* with *Smart Notebook* software

As each character was introduced in the story, a new student would come to the board to help figure out how much money the child had and how much money would be left over.

After we finished reading the book, we had a classroom discussion about how Jessie was able to paint her face. Then we discussed the total amount of money that was in the "penny pot" and if Jessie would need to use all the money that was there.

Teacher: "Why could Jessie not paint her face at the beginning of the story, but at the end she was able to paint her face?"

Caroline: "She did not have enough money at the beginning. When the other kids got their faces painted they left money in the penny pot."

Teacher: "So how could Jessie paint her face at the end?"

Caroline: "She used the money from the penny pot."

Teacher: "Did she use all the money in the penny pot?"

Christopher: "No!"

Teacher: "Why not?"

Christopher: "She left a penny because she did not need it."

Teacher: "Why did she not need it?"

Jacqueline: "She only needed 11 cents and there was 12 cents in the penny pot."

The students were able to see that Jessie did not have 50 cents at the beginning of the story, but with everyone's extra money she was able to use some of the money to have enough to get her face painted.

I then directed the discussion to include what happens on bake sale day in the classroom. I began the discussion by giving each student 70 cents. We then listed the things that they can buy and the price of each item.

Cookies	25 cents
Brownies	25 cents
Chips	50 cents
Nachos	75 cents
Juice Box	50 cents
Raffle Ticket	25 cents

The students then had to decide what they could buy from the bake sale with their money and write down what they would buy on the paper they were given. The students had to say why they could buy the item(s) they listed. After each student was done, we went around the classroom and the students said what they would buy with their 70 cents.

Zachary: "I would buy two cookies."

Teacher: "Could you buy anything else?"

Zachary: "No, I only have 20 cents left."

Teacher: "What did you say you would buy?"

Molly: "I would buy a raffle ticket and a brownie."

Teacher: "Did you use all your money?"

Molly: "No, only used 50 cents."

Teacher: "Why did no one buy nachos?"

Therese: "Because we did not have enough money. We only had 70 cents not 75 cents."

In Summary

Reading and writing have both oral and written practices that provide opportunities for students to communicate what they have learned in mathematics to their teachers and classmates. Using literacy in mathematics as a tool to explain and explore what students are thinking, to discover new ideas, and to generate thoughts helps students develop new mathematical concepts (Whitin & Whitin 2000). The use of children's literature helps students see how mathematics is everywhere and that mathematics can be used to solve real world problems.

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